THE HOLOCENE-PLEISTOCENE BOUNDARY ZONE IN THE LAGOON OF VENICE

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Abstract

The results of a detailed study on the sediments representative of the boundary area from the Late-Pleistocene and the Lower-Holocene sedimentations are reported. Mineralogical, granulometric and geochemical investigations have been carried out to characterise the clay-rich samples taken along the littoral bar and representative of the continental and marine sedimentations. Particular attention was devoted to the study of the overconsolidated clay layer considered to be the last continental deposit before the Holocene (Flandrian) transgression and interpreted as a paleosol.

Introduction

The arch-shaped Lagoon of Venice, located in the north-western Adriatic Sea, covers an area of about 550 square Km, is separated from the open sea by a narrow littoral sand bar.

At present the lagoon communicates with the open sea by three openings that allow water exchange and maintain the marine character of the lagoon, while all the major rivers have been diverted outside the lagoon.

This study focuses on the mineralogical and textural aspects of the overconsolidated clay layer at the Holocene-Pleistocene boundary zone in comparison to the closely overlying and underlying clay-rich layers.

Late-Quaternary evolution of the Venetian lagoon

The paleoevolution of the Venetian basin has been characterised by three main episodes:

- the Pleistocene continental sedimentation during the Würm glaciation, when the climate varied from cold and dry to cold and very dry, and the Adriatic Sea level was 90 to 130 m lower than present and the coastline was about 300 km further South.
- the period of emergence of about 11,000 years (from 18,000 to 7,000 years B.P.) that characterised the final phase of the Pleistocene, with almost no sedimentation. During this time the climate improved and the carbonate muds were drained, desiccated, compacted and oxidised to form the

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overconsolidated clay level representative of the Holocene/Pleistocene limit and locally known as *caranto*.

- the Holocene Flandrian transgression characterised by a warm and humid climate, during which the continental sediments were partly eroded, reworked and dispersed by the intense fluvial activity. While the climate improved the sea level began to rise over the northern Adriatic paleoplain and the coastline moved northwards until it reached approximately the present position, about 6,000 years B.P., and formed the thin sandy bar that delineates the primordial Venetian Lagoon. The intense fluvial activity, with *overflow* episodes, at first and the marine one later, partly eroded and reworked the hard clay layers leaving deep scars in the morphology.

This study focuses on the textural, mineralogical and chemical characteristics of the *caranto* layer in comparison with the other overlying and underlying clay-rich layers. The hard clay layer (*caranto*) shows a fairly high consistence due to the prolonged subareal exposure in cold and very dry climate that favoured the drainage and consolidation process. The effect of the climatic variation can be found in the mineralogical and chemical (Fig. 1,2) compositions and textural characteristics that are quite different from those of the clay layers above and below the *caranto.*

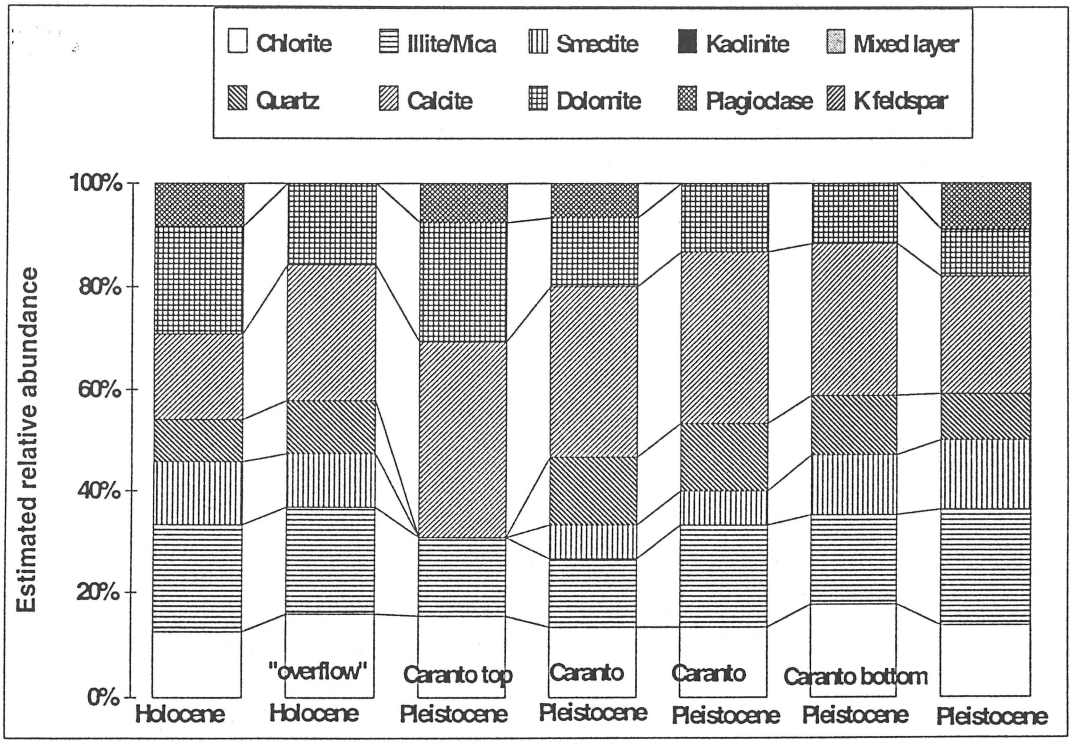

Fig. 1

Particle size distribution is shown as percentage of clay (<2 microns), silt (2-60 microns), and sand (> 60 microns) particle in each sample (Fig.1). The plot of this data shows that these samples are classified as silt to sandy silts.

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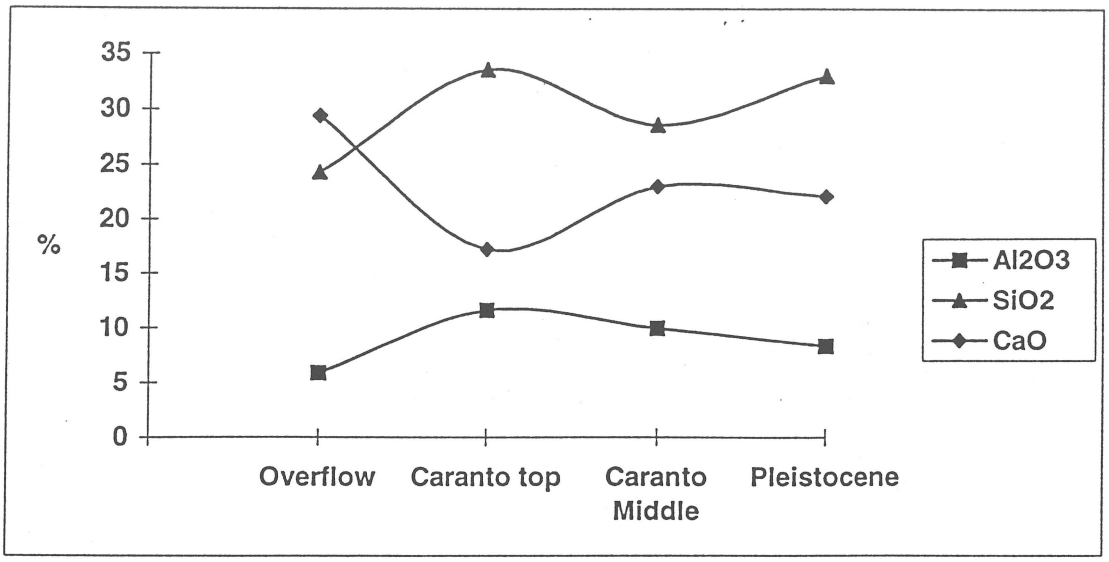

Fig. 2

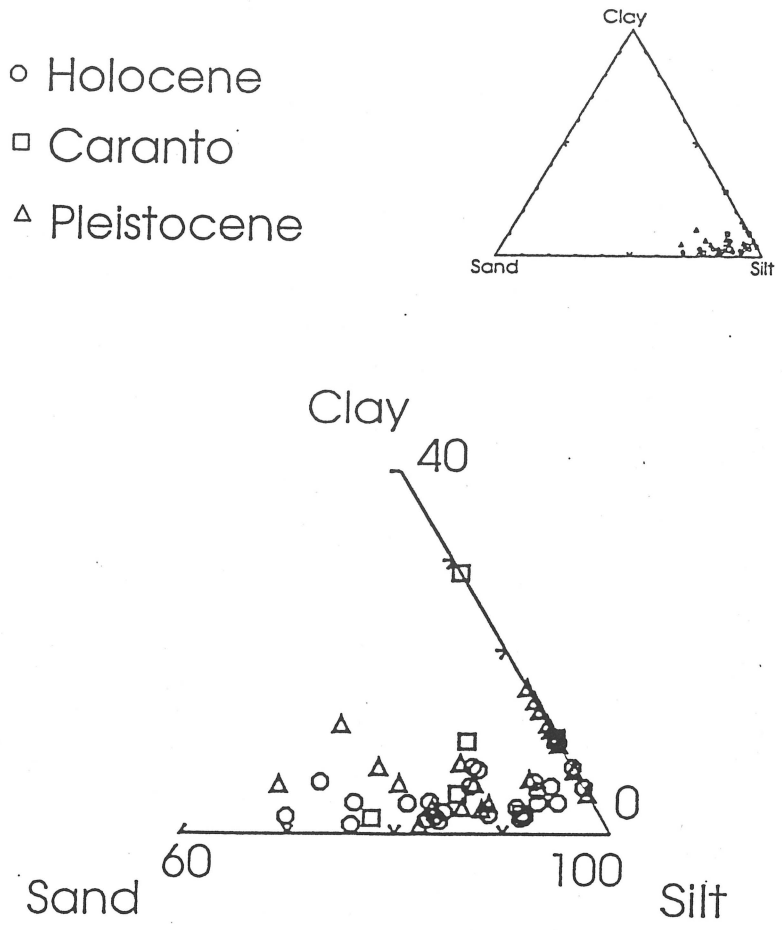

Fig. 3

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Conclusions

This study has indicated that the chemical, mineralogical and textural characteristics of the clay sediments in the Holocene/Pleistocene boundary zone are closely related mainly to the paleoclimatic changes and, to a less extent, to the depositional environments.

A similar approach was used to investigate the boundary zone in the South Yellow Sea and in the Yangtze River Delta (China).

The results from both investigations indicate that exists a close correlation between paleoclimatic events and compositional and textural variations of the sediments

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